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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/581,875	08/28/2006	JinKook Lee	AGTZ 2 00068	1940
27885	7590	10/04/2007		
FAY SHARPE LLP 1100 SUPERIOR AVENUE, SEVENTH FLOOR CLEVELAND, OH 44114			EXAMINER VERDIER, CHRISTOPHER M	
			ART UNIT 3745	PAPER NUMBER
			MAIL DATE 10/04/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/581,875

Applicant(s)

LEE, JINKOOK

Examiner

Christopher Verdier

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 6-5-06 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6-5-06</u> . | 6) <input type="checkbox"/> Other: _____ |

Oath/Declaration

The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:
It incorrectly lists the year of the U.S. Provisional Application as "2004", which should be 2003.

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: all reference numerals in paragraphs [0025] to [0029] of the specification, reference numerals "12" and "14" in paragraph [0031] of the specification, and reference numerals "150b", and "150c".

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: "152a", "152b", "154a", "154b", "156a", "156b", and "156c". Applicant should carefully check the specification and drawings to ensure that all reference signs mentioned in the description are included in the drawings, and vice versa.

Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate

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prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The abstract of the disclosure does not commence on a separate sheet in accordance with 37 CFR 1.52(b)(4). A new abstract of the disclosure is required and must be presented on a separate sheet, apart from any other text.

The disclosure is objected to because of the following informalities: Appropriate correction is required.

In paragraph 4, line 3, -- a -- should be inserted after "is".

In paragraph 14, line 3, "has" should be changed to -- have --.

In paragraph 30, line 1, "showings" should be changed to -- drawings --.

In paragraph 31, line 11, "is" should be changed to -- are --.

In paragraph 35, lines 4-5, "an increasing blade depth ... the leading edge" is non-idiomatic.

Claim Objections

The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not). Claim 8 is missing.

Misnumbered claims 9-20 have been renumbered as claims 8-19, respectively.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 7-8, and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by the publication “An Experimental Study of Cavitation in A Mixed Flow Impeller” (figure 1, impellers A and B, and figure 2). Note the inducer for pumping cryogenic two phase fluids from reservoirs, comprising a hub with a first portion having a first diameter and a second portion having a second diameter larger than the first diameter, plural primary blades circumferentially disposed about the hub, plural secondary blades circumferentially disposed about the hub, with each secondary blade being interposed between two primary blades, the hub increasing in diameter from the first portion to the second portion, a radial depth of the

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plural primary and secondary blades being substantially greater at the first portion of the hub than at the second portion of the hub, an outer diameter of each primary blade and each secondary blade being generally constant from a leading edge to a trailing edge of the primary and secondary blades, the blades having a generally helical conformation, the primary blades extending circumferentially about the hub generally 180 degrees from a leading edge to a trailing edge thereof, with a leading edge of each secondary blade being circumferentially spaced generally 60 degrees from a leading edge of an adjacent primary blade (see in particular impeller A).

Claims 1-2 are rejected under 35 U.S.C. 102(b) as being anticipated by Kun 4,904,158. Note the inducer for pumping cryogenic two phase fluids from reservoirs, comprising a hub near 8 with a first portion near 6 having a first diameter and a second portion near 5 having a second diameter larger than the first diameter, plural primary blades 4 circumferentially disposed about the hub, plural unnumbered secondary blades circumferentially disposed about the hub, with each secondary blade being interposed between two primary blades, the hub increasing in diameter from the first portion to the second portion.

Claims 1-3 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Meng 6,435,829 (figures 1 and 7). Note the inducer for pumping cryogenic two phase fluids from reservoirs, comprising a hub 12 with a first front portion having a first diameter and a second rear portion having a second diameter larger than the first diameter, plural primary blades 14 circumferentially disposed about the hub, plural secondary blades 14 circumferentially

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disposed about the hub, with each secondary blade being interposed between two primary blades, the hub increasing in diameter from the first portion to the second portion, a radial depth of the plural primary and secondary blades being substantially greater at the first portion of the hub than at the second portion of the hub, and the primary blades having a generally helical conformation.

Claims 1-4, 7, 10, 13-15, and 17-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Coats 1,874,450 (figures 1-2). Note the inducer for pumping cryogenic two phase fluids from reservoirs, comprising a hub 6 with a first portion having a first diameter and a second portion having a second diameter larger than the first diameter, plural primary blades 5 circumferentially disposed about the hub, plural secondary blades 5 circumferentially disposed about the hub, with each secondary blade being interposed between two primary blades, the hub increasing in diameter from the first portion to the second portion, a radial depth of the plural primary and secondary blades being substantially greater at the first portion of the hub than at the second portion of the hub, an outer diameter of each primary blade and each secondary blade being generally constant from a leading edge to a trailing edge of the primary and secondary blades, the blades having a generally helical conformation, a leading edge of each secondary blade being circumferentially spaced generally 60 degrees from a leading edge of an adjacent primary blade. The inducer is part of a downhole pump assembly including casing 1. The pump is a submersible pump.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over the publication "An Experimental Study of Cavitation in A Mixed Flow Impeller" in view of Kato 5,947,684. Figure 1, impellers A and B, and figure 2 of the publication "An Experimental Study of Cavitation in A Mixed Flow Impeller" disclose a high performance inducer substantially as claimed as set forth above, but do not disclose that the first portion of the hub includes a generally rounded end and a sidewall extending both radially outward and axially from the rounded end, with the sidewall having a general curvilinear conformation.

Kato 5,947,684 (figure 2) shows an inducer 12 having a first portion of a hub includes a generally rounded end 19 and an unnumbered sidewall extending both radially outward and axially from the rounded end, with the sidewall having a general curvilinear conformation, for the purpose of smoothly guiding flow to the inducer.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the impellers A and B of the publication "An Experimental Study of Cavitation in A Mixed Flow Impeller" such that the first portion of the hub includes a

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generally rounded end and a sidewall extending both radially outward and axially from the rounded end, with the sidewall having a general curvilinear conformation, as taught by Kato 5,947,684, for the purpose of smoothly guiding flow to the inducer.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over the publication "An Experimental Study of Cavitation in A Mixed Flow Impeller" in view of Mottram 3,442,220. Figure 1, impellers A and B, and figure 2 of the publication "An Experimental Study of Cavitation in A Mixed Flow Impeller" disclose a high performance inducer substantially as claimed as set forth above, but do not disclose that the leading edge of each primary blade is spaced generally 120 degrees from a leading edge of an adjacent primary blade.

Mottram (figures 2-3) shows a pump for liquids containing gases having an impeller with a hub 1 having blades 2, each blade having a leading edge spaced generally 120 degrees from a leading edge of an adjacent blade, for the purpose of allowing pumping from a low suction head.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the impellers A and B of the publication "An Experimental Study of Cavitation in A Mixed Flow Impeller" such that the leading edge of each primary blade is spaced generally 120 degrees from a leading edge of an adjacent primary blade, as taught by Mottram, for the purpose of allowing pumping from a low suction head.

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Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over the publication “An Experimental Study of Cavitation in A Mixed Flow Impeller”: Figure 1, impellers A and B, and figure 2 of the publication “An Experimental Study of Cavitation in A Mixed Flow Impeller” disclose a high performance inducer substantially as claimed as set forth above including secondary blades each with a leading edge and a trailing edge, but do not disclose that a circumferential extent from the leading edge of each secondary blade to the trailing edge of each secondary blade is generally 150 degrees.

The recitation of the circumferential extent from the leading edge of each secondary blade to the trailing edge of each secondary blade being generally 150 degrees is a matter of choice in design. The circumferential extent from a leading edge of a helical blade to a trailing edge of the blade in an inducer is known to be a result effective variable which influences the efficiency and head of the inducer. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the impellers A and B of the publication “An Experimental Study of Cavitation in A Mixed Flow Impeller” such that the circumferential extent from the leading edge of each secondary blade to the trailing edge of each secondary blade is generally 150 degrees, for the purpose of optimizing the efficiency and head, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over the publication “An Experimental Study of Cavitation in A Mixed Flow Impeller” in view of Rylewski

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3,522,997. Figure 1, impellers A and B, and figure 2 of the publication "An Experimental Study of Cavitation in A Mixed Flow Impeller" disclose a high performance inducer substantially as claimed as set forth above, but do not disclose that the primary blades and secondary blades have a thickness that tapers from a leading edge of the primary and second blades to a substantially constant thickness over the remaining circumferential extent of the primary and secondary blades.

Rylewski 3,522,997 (figures 2-3 and column 4, lines 42-47) shows an inducer 10 having blades 13, 13' that have a thickness that tapers from a leading edge of the blades to a substantially constant thickness over the remaining circumferential extent of the blades, for the purpose of providing constant flow over the blades.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the impellers A and B of the publication "An Experimental Study of Cavitation in A Mixed Flow Impeller" such that the primary blades and secondary blades have a thickness that tapers from a leading edge of the primary and second blades to a substantially constant thickness over the remaining circumferential extent of the primary and secondary blades, as taught by Rylewski 3,522,997, for the purpose of providing constant flow over the blades.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Coats 1,874,450 in view of Rylewski 3,522,997. Coats discloses a high performance inducer substantially as

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claimed as set forth above, but does not disclose that the primary blades and secondary blades have a thickness that tapers from a leading edge of the primary and second blades to a substantially constant thickness over the remaining circumferential extent of the primary and secondary blades.

Rylewski 3,522,997 (figures 2-3 and column 4, lines 42-47) shows an inducer 10 having blades 13, 13' that have a thickness that tapers from a leading edge of the blades to a substantially constant thickness over the remaining circumferential extent of the blades, for the purpose of providing constant flow over the blades.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the impeller of Coats such that the primary blades and secondary blades have a thickness that tapers from a leading edge of the primary and second blades to a substantially constant thickness over the remaining circumferential extent of the primary and secondary blades, as taught by Rylewski 3,522,997, for the purpose of providing constant flow over the blades.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Coats 1,874,450. Coats discloses a high performance inducer substantially as claimed as set forth above, but does not disclose that the vapor to liquid ratio of the pumped fluid is up to about a 1:1 ratio.

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The vapor to liquid ratio of an inducer is a well-known variable which affects both the efficiency and performance of the inducer. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the inducer of Coats such that the vapor to liquid ratio of the pumped fluid is up to about a 1:1 ratio by adjusting the inducer blade and hub configuration to obtain the specific vapor to liquid ratio, for the purpose of optimizing both the efficiency and performance of the inducer, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Carter is cited to show a submerged pumping system of a cryogenic storage system.

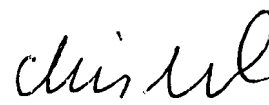
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Verdier whose telephone number is (571) 272-4824. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward K. Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

C.V.
September 27, 2007



Christopher Verdier
Primary Examiner
Art Unit 3745